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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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pathou@conleyrose.com

Office Action Summary	Application No. 10/597,342	Applicant(s) CHIN ET AL.	
	Examiner SUNG AHN	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 July 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. Figures 1, 3(a), and 6(a) should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the modulator for converting parallel sequence to a parallel of impulse trains (Fig. 6 (c)) and the pulse generator for forming pulse sequence based on said combined signal (Fig. 6 (B)) must be shown on same drawing or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure

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is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

3. Claims 2-7 are objected to because of the following informalities: The word "A system" need to be change to "The transmitter system". Appropriate correction is required.
4. Claims 9-20 are objected to because of the following informalities: The word "A system" need to be change to "The receiver system". Appropriate correction is required.
5. Claims 26-28 and 30-35 are objected to because of the following informalities: The word "A method" need to be change to "The method". Appropriate correction is required.
6. Claims 22-24 are objected to because of the following informalities: The acronym for first "DS-CDMA" need to be spelled out when it is used first time in each independent or subsequent dependent claim. Appropriate correction is required.

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7. Claim 3 objected to because of the following informalities: The word “a parallel sequence” need to be change to “the parallel sequence” in line 3. Appropriate correction is required.

8. Claim 7 objected to because of the following informalities: The word “said spreader unit” need to be change to “the spreader” in line 3. Appropriate correction is required.

9. Claim 8 objected to because of the following informalities: The word “said pulsed signal” need to be change to “said pulsed ultrawide band signal” in lines 4 and 5. Appropriate correction is required.

10. Claim 8 objected to because of the following informalities: The word “said received signal” need to be change to “said pulsed ultrawide band signal” in lines 9, 11, and 15. Appropriate correction is required.

11. Claim 8 objected to because of the following informalities: The word “said converter” need to be change to “said analogue-to-digital converter” in line 17. Appropriate correction is required.

12. Claim 16 objected to because of the following informalities: The word “said pulsed signal” need to be change to “said pulsed ultrawide band signal” in line 3. Appropriate correction is required.

13. Claim 17 objected to because of the following informalities: The word “said pulsed signal” need to be change to “said pulsed ultrawide band signal” in line 5. Appropriate correction is required.

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14. Claim 21 objected to because of the following informalities: The line starting “an antenna for transmitting” need to be indented. Appropriate correction is required.

15. Claim 21 objected to because of the following informalities: The word “said pulsed signal” need to be change to “said pulsed ultrawide band signal”. Appropriate correction is required.

16. Claim 21 objected to because of the following informalities: The word “said converter” need to be change to “said analogue-to-digital converter”. Appropriate correction is required.

17. Claim 26 objected to because of the following informalities: The word “a serial sequence” need to be change to “the serial sequence” in line 3. Appropriate correction is required.

18. Claim 26 objected to because of the following informalities: The word “a parallel sequence” need to be change to “the parallel sequence” in line 3. Appropriate correction is required.

19. Claim 27 objected to because of the following informalities: The word “a modulator” need to be change to “the modulator” in line 1. Appropriate correction is required.

20. Claim 28 objected to because of the following informalities: The word “a modulator” need to be change to “the modulator” in line 1. Appropriate correction is required.

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21. Claim 29 objected to because of the following informalities: The word "said pulsed signal" need to be change to "said pulsed ultrawide band signal". Appropriate correction is required.

22. Claim 29 objected to because of the following informalities: The word "said matched filter said processed signal" need to be change to "said matched filter to process said processed signal" in line 11. Appropriate correction is required.

Claim Rejections - 35 USC § 112

23. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

24. Claims 2 and 3 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

25. Claim 2 recites the limitation "said first converter" in line 2. There is insufficient antecedent basis for this limitation in the claim.

26. Claim 3 recites the limitation "said first converter" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

27. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

28. Claims 1-7 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5960028 to Okamoto et al. in further view of U.S. PGPub. No. 20040032354 to Knobel et al. and U.S. PGPub. No. 20050113045 to Santhoff et al.

As to **Claim 1**, Okamoto disclose a transmitter system for transmitting data as a pulsed ultrawide band signal comprising (Fig. 1, Col. 1 lines 11-22, where wideband spread spectrum communication system is used for overcoming the multiple path fading and narrow band noise):

a converter for converting a signal to be transmitted from a serial sequence to a parallel sequence (Fig. 1 (5));

a modulator to convert said parallel sequence to a parallel stream of modulated signal, each modulated signal having a signal repetition period (Fig. 1 (19, 21, 23, 25), Fig. 29, Col. 39 lines 35-44, where the spreaded and modulated signals are multiplexed in one period (Fig. 29 (b)) to be transmitted in repeated fashion (repeated period));

a delay unit to delay said parallel streams of modulated signal by different time intervals within the same signal repetition period (Fig. 1 (27, 29, 31, 33), Col.

11 lines 53-63, where the delay time is inserted to reduce the interference between each parallel signal);

a signal combining unit to combine the delayed modulated signal streams to form a combined signal so that the modulated signal in the streams occur within the signal repetition period of a single signal (Fig. 1 (35), Col. 11 line 66-Col. 12 line 3, where the delayed modulated signal stream is multiplexed (combined) to be transmitted);

an antenna for transmitting said pulse sequence (Fig. 1 (41)).

Okamoto disclose the transmitter for wideband spread spectrum communication system by S/P conversion, modulation, and delayed element (Fig. 1) but does not explicitly disclose the modulated signal being stream of impulse trains.

Meanwhile Knobel disclose the implementation of multi-band pulsed OFDM modulation (Fig. 14 (1404)) in transmitter to transmit train of pulses (Fig. 12) through the multiple bands (Fig. 14 and 12, paragraph [0135]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Okamoto and Knobel as a whole to produce the invention as claimed with an expectation of reducing the interferences, power consumptions, and increasing data rate by using multi-band pulse OFDM modulation over conventional narrow band communication system (Knobel – paragraph [0006-0008]).

Okamoto in view of Knobel disclose the transmitter for wideband spread spectrum communication system performing S/P conversion, multi-band pulsed OFDM modulation, and delayed element (Okamoto - Fig. 1, Knobel – Fig. 14) but does not explicitly disclose the pulse generator to form a pulse sequence based on said combined signal.

Meanwhile Santhoff disclose the transmitter and receiver performing physical interface, logic and routing functions of bridging, transferring UWB and non-UWB data as ultra wideband (UWB) communication system offers reduced power and interference over narrowband communication system (paragraph [0040, 0047]). For example, Fig. 6 and 7 shows the transmitting and receiving interleaved (combined) serial data stream over ultra wideband by modulating data stream with UWB pulse from UWB pulse generator (Fig. 6 and 7, paragraph [0081]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Okamoto, Knobel, and Santhoff as a whole to produce the invention as claimed with on expectation of improving design choice of transmitter and receiver by performing physical interface, logic and routing functions of bridging, or transferring UWB and non-UWB formatted data between dissimilar media types (wires or wireless) (Santhoff – paragraph [0047, 0096]).

As to **Claims 2 and 3**, Okamoto further disclose the transmitter system further comprising plurality of spreader unit (spreader) coupled to said first

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converter for receiving said parallel sequence and for spreading said parallel sequence (Fig. 1 (11, 13, 15, 17), Col. 11 lines 47-52, where each parallel sequence is spread with PN sequences from PN generator).

As to **Claim 4**, Santhoff further disclose the transmitter system wherein said modulator has an input and an output, said input being connected to said signal combining unit and said output being connected to said antenna (Fig. 6 (UWB modulator), paragraph [0081], where the UWB modulator received interleaved (combined) serial data stream as input and output the UWB modulated signal with UWB pulse to the antenna). The suggestion/motivation is the same as that used in the rejection for claim 1.

As to **Claim 5**, Okamoto further disclose the transmitter system wherein said modulator has an input and an output, said input being connected to said converter and said output being connected to said delay unit (Fig. 1 (19, 21, 23, 25), Col. 11 lines 35-44, where each modulator is located between S/P converter and delay element. Also the spreader can be omitted as shown in Knobel (Fig. 14) to reduce the circuit complexity). The suggestion/motivation is the same as that used in the rejection for claim 1.

As to **Claim 6**, Okamoto further disclose the transmitter system further comprising a delay unit for each stream (Fig. 1 (27, 29, 31, 33)).

As to **Claim 7**, Okamoto further disclose the transmitter system further comprising a spread code generator to drive said spreader unit (Fig. 1 (7)).

As to **Claim 22**, Knobel further disclose the known spread spectrum technique including CDMA, direct sequence spread spectrum, time hopping spread spectrum, etc. (paragraph [0008]). The suggestion/motivation is the same as that used in the rejection for claim 1.

29. Claims 8-17, 19, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PGPub. No. 20040151109 to Batra et al. in further view of U.S. Pat. No. 5960028 to Okamoto et al. and U.S. PGPub. No. 20040032354 to Knobel et al.

As to **Claim 8**, Batra disclose a receiver system for receiving data as a pulsed ultrawide band signal comprising (Fig. 40, paragraph [0364, 0365, 0372, 0373], where both the transmitter and receiver architectures is listed for UWB system):

a receiving antenna for receiving signal (Fig. 40, where the signal is received through the antenna);

a matched filter coupled to said antenna for filtering said received signal to form a filtered signal, said filter being matched to the pulse shape of said received signal (Fig. 40 (506, 508), paragraph [0373, 0374], where the received

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signal is mixed down (filtered) to baseband signal using carrier frequency centered at 4096 MHz. Such configuration is equivalent to Applicant's described matched filter in Fig. 8 (72) and Page 12 5th paragraph where receiver matched filter is sinusoidal waveform (local oscillator having center frequency));

a low-pass filter coupled to said matched filter to process said filtered signal to form a processed signal (Fig. 40 (518, 520));

an analogue-to-digital converter coupled to said low-pass filter to convert, at a rate greater than the pulse repetition frequency of said received signal, said processed signal from an analogue signal to a digital signal (Fig. 40 (518, 520), paragraph [0375], where the ADC running at 512 MHz with 4-bit resolution (higher rate resolution));

a serial-to-parallel conversion unit coupled to said converter to convert said digital signal to produce N parallel sampled signals (Fig. 40 (534));

a signal processor coupled to said serial-to-parallel conversion unit to produce an output signal representative of said received data (Fig. 40 (536, 538, 540, 542, 544), paragraph [0375, 0376], where the receiver include FFT, despreaders, equalizers, decoders, and descramblers to generate serial data stream from the digital data stream from the ADC).

Batra disclose the transmitter architecture for UWB system employing time-frequency interleaved OFDM (Fig. 40, paragraph [0022, 0023]) but does not explicitly disclose the pulsed ultrawide band signal, said pulsed signal having a pulse shape, a bandwidth, a pulse width, and a pulse repetition frequency, said

pulsed signal comprising two or more interleaved pulse trains having equal pulse repetition periods, said interleaved pulse trains being spaced by a pulse spacing, said pulse repetition period being greater than said pulse spacing.

Meanwhile Okamoto disclose the modulator and corresponding demodulation in receiver to modulate and multiplex signals interleaved in one period (Fig. 29 (b)) to be transmitted in repeated fashion (repeated period) (Fig. 1 (19, 21, 23, 25), Fig. 29, Col. 39 lines 35-44). Also time difference between adjacent signals is kept at constant further limiting interference between signals (Col. 13 lines 15-21, where pulse spacing is shorter than repetition period of T shown in Fig. 29 (b)).

Also Knobel disclose the implementation of multi-band pulsed OFDM modulation (Fig. 14 (1404)) in transmitter to transmit train of pulses (Fig. 12, implicitly having pulse shape, pulse width, and pulse repetition frequency) through the multiple bands (Fig. 14 and 12, paragraph [0135]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Batra, Okamoto, and Knobel as a whole to produce the invention as claimed with on expectation of reducing the interferences, power consumptions, and increasing data rate by using multi-band pulse OFDM modulation over conventional narrow band communication system (Knobel – paragraph [0006-0008]).

As to **Claim 9**, Batra further disclose the receiver system wherein said receiver matched filter is a sinusoidal waveform (Fig. 40 (506, 508), paragraph [0373], where the received signal is mixed down (filtered) to baseband signal using carrier frequency centered at 4096 MHz ($\cos(2\pi f_c t)$ and $\sin(2\pi f_c t)$ sinusoidal wave)).

As to **Claim 10**, Batra further disclose the receiver system wherein said receiver matched filter is a local oscillator having a center frequency equal to the inverse of the pulse width (Fig. 40 (506, 508), paragraph [0373], where the received signal is mixed down (filtered) to baseband signal using carrier frequency centered at 4096 MHz which implicitly generated by local oscillator (the center frequency is implicitly equal to inverse of the pulse width)).

As to **Claim 11**, Batra further disclose the receiver system wherein said low-pass filter has bandwidth substantially equal to the bandwidth of said pulse (Fig. 40 (518, 520), paragraph [0374], where the low pass filter had specific cutoff frequency to reject image or adjacent channel interference (the cutoff frequency is implicitly equal to bandwidth of pulse in channel)).

As to **Claim 12**, Batra further disclose the receiver system further comprising a quadrature mixer coupled between said receiving antenna and said matched filter for separating in-phase and quadrature pulse chains from said

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received signal (Fig. 40 (506, 508), paragraph [0373], where the received signal is mixed down by pair of mixers (506, 508) to separate signal to in-phase and quadrature signals).

As to **Claim 13**, Batra further disclose the receiver system further comprising a plurality of matched filters, and/or analogue-to-digital converters, and/or serial-to-parallel conversion units, each pulse chain having a respective matched filter, and/or analogue-to-digital converter, and/or serial-to-parallel conversion unit (Fig. 40, mixers (506, 508), ADC (526, 528), S/P (534)).

As to **Claim 14**, Batra further disclose the receiver system wherein said quadrature mixer is arranged to operate at a frequency substantially equal to the inverse of the pulse width (Fig. 40 (506, 508), paragraph [0373], where the received signal is mixed down (filtered) to baseband signal using carrier frequency centered at 4096 MHz (the center frequency is implicitly equal to inverse of the pulse width)).

As to **Claim 15**, Okamoto further disclose the receiver system wherein said signal processor comprises N delay units for receiving said N parallel sampled signals, each of said N delay units being arranged to delay one of said N parallel sampled signals by one or more pulse repetition periods (Fig. 12 (97, 99, 101, 103), Col. 13 lines 22-25, where the equivalent delay is performed in the

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receiver by delay element (Fig. 12 (97, 99, 101, 103)) as delay element added in the transmitter (Fig. 1 (27, 29, 31, 33)). The suggestion/motivation is the same as that used in the rejection for claim 8.

As to **Claim 16**, Okamoto further disclose the receiver system wherein said N delay units comprise a series of multi-tap delay networks for selecting a predetermined pulse stream from said received pulsed signal (Fig. 12 (97, 99, 101, 103), Col. 14 lines 51-54, Col. 48 lines 33-37, where the digital delay element is used for adjusting delay amount which varies with number of multiplexing signals. Also it is well known in art that multiple tap delay is used for adjusting delay in line as shown in Fig. 2 (Col. 2 lines 23-38) of U.S. Pat. No. 7088172 presented here as evidential reference). The suggestion/motivation is the same as that used in the rejection for claim 8.

As to **Claim 17**, Batra further disclose the receiver system wherein said signal processor further comprises a channel equalizer having an input coupled to one or more outputs of said one or more delay units for equalizing one or more channels in said predetermined pulse stream to form an output signal representative of said received data (Fig. 40 (540), paragraph [0376], where the equalizer compensate the effects of the channel).

As to **Claim 19**, Batra further disclose the receiver system further comprising a despreader coupled between said one or more delay units and said channel equalizer to despread said delayed signal (Fig. 40 (538) - despreader).

As to **Claim 23**, Knobel further disclose the known spread spectrum technique including CDMA, direct sequence spread spectrum, time hopping spread spectrum, etc. (paragraph [0008]). The suggestion/motivation is the same as that used in the rejection for claim 8.

30. Claims 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PGPub. No. 20040151109 to Batra et al., U.S. Pat. No. 5960028 to Okamoto et al., and U.S. PGPub. No. 20040032354 to Knobel et al. in further view of U.S. PGPub. No. 20030123525 to Smee et al.

As to **Claim 18**, Batra in view Okamoto and Knobel disclose the receiver comprising the equalizer for compensating effects of the channel (Batra - Fig. 40 (540)) but does not explicitly disclose the channel equalizer to apply a recursively square algorithm to said predetermined pulse stream.

Meanwhile Smee disclose the adaptive equalizer at the receiver using prescribed algorithm such as "least mean square" (LMS) or "recursive least squares" (RLS) to estimate the adaptive equalizer coefficients in order to compensate for the Inter Symbol Interference (ISI) caused by transmitter and receiver filter and the communication channel (paragraph [0011]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Batra, Okamoto, Knobel, and Smee as a whole to produce the invention as claimed with on expectation of further reducing Inter Symbol Interference (ISI) caused by transmitter and receiver filter and the communication channel (Smee – paragraph [0011]).

As to **Claim 20**, Batra in view Okamoto and Knobel disclose the receiver comprising the equalizer for compensating effects of the channel (Batra - Fig. 40 (540)) but does not explicitly disclose the channel equalizer is pilot assisted adaptive channel equalizer.

Meanwhile Smee disclose the adaptive equalizer at the receiver adjusting equalization parameters using known pilot symbol sequence (paragraph [0010]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Batra, Okamoto, Knobel, and Smee as a whole to produce the invention as claimed with on expectation of tracking varying characteristics of channel using known pilot symbol sequences (Smee – paragraph [0010]).

31. Claims 21 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5960028 to Okamoto et al. in further view of U.S. PGPub. No. 20040032354 to Knobel et al. and U.S. PGPub. No. 20040151109 to Batra et al.

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As to **Claim 21**, Okamoto disclose a transceiver system comprising a transmitter for transmitting data as a pulsed ultrawide band signal comprising (Fig. 1, Col. 1 lines 11-22, where wideband spread spectrum communication system including transmitter and corresponding receiver is used for overcoming the multiple path fading and narrow band noise):

a converter for converting a signal to be transmitted from a serial sequence to a parallel sequence (Fig. 1 (5));

a modulator to convert said parallel sequence to a parallel stream of modulated signal, each modulated signal having a signal repetition period (Fig. 1 (19, 21, 23, 25), Fig. 29, Col. 39 lines 35-44, where the spreaded and modulated signals are multiplexed in one period (Fig. 29 (b)) to be transmitted in repeated fashion (repeated period));

a delay unit to delay said parallel streams of modulated signal by different time intervals within the same signal repetition period (Fig. 1 (27, 29, 31, 33), Col. 11 lines 53-63, where the delay time is inserted to reduce the interference between each parallel signal);

a signal combining unit to combine the delayed modulated signal streams to form a combined signal so that the modulated signal in the streams occur within the signal repetition period of a single signal (Fig. 1 (35), Col. 11 line 66-Col. 12 line 3, where the delayed modulated signal stream is multiplexed (combined) to be transmitted);

an antenna for transmitting said pulse sequence (Fig. 1 (41)),

said receiver for receiving data as pulsed ultrawide band signal comprising a receiver for receiving data as ultrawide band signal comprising (Fig. 19, Col. 1 lines 11-22, where wideband spread spectrum communication system including transmitter and corresponding receiver is used for overcoming the multiple path fading and narrow band noise):

a receiving antenna for receiving signal (Fig. 19 (91), where the signal is received through the antenna);

a matched filter coupled to said antenna for filtering said received signal to form a filtered signal, said filter being matched to the pulse shape of said received signal (Fig. 19 (129, 241, 243), Col. 27 lines 39-50, where the received signal is converted to in-phase (I) and quadrature (Q) baseband signal using local frequency signal from local oscillator (Fig. 19 (129)). Such configuration is equivalent to Applicant's described matched filter in Fig. 8 (72) and Page 12 5th paragraph where receiver matched filter is sinusoidal waveform (local oscillator having center frequency));

an analogue-to-digital converter to convert said processed signal from an analogue signal to a digital signal (Fig. 105 (765, 766), disclose another embodiment of applying A/D converter to convert the analog signal to the digital signal);

a serial-to-parallel conversion unit coupled to said converter to convert said digital signal to produce N parallel sampled signals (Fig. 19 (245, 247), Col. 27 lines 51-55, where the distributors (245, 247 – serial to

parallel conversion unit) generates plurality of signals from baseband I and Q signal);

a signal processor coupled to said serial-to-parallel conversion unit to produce an output signal representative of said received data (Fig. 19 Col. 27 lines 51-67, where the receiver include delay elements, correlators (despreader), differentiating portion, and determining portion to generate the data from plurality of signals from distributors).

Okamoto disclose the transmitter and receiver for wideband spread spectrum communication system by S/P conversion, modulation, and delayed element (Fig. 1) but does not explicitly disclose the modulated signal being stream of impulse trains from pulse generator.

Meanwhile Knobel disclose the implementation of multi-band pulsed OFDM modulation (Fig. 14 (1404)) in transmitter to transmit train of pulses (Fig. 12) through the multiple bands (Fig. 14 and 12, paragraph [0135]). Where multi-band pulsed OFDM modulator implicitly include the impulse generator as shown in Fig. 2 (abstract) of U.S. Pat. No. 6026125 presented here as evidential reference.

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Okamoto and Knobel as a whole to produce the invention as claimed with on expectation of reducing the interferences, power consumptions, and increasing data rate by using multi-band pulse OFDM

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modulation over conventional narrow band communication system (Knobel – paragraph [0006-0008]).

Okamoto in view of Knobel disclose the receiver for wideband spread spectrum communication system for converting in-phase (I) and quadrature (Q) baseband signal using local frequency signal from local oscillator (Okamoto - Fig. 105 (764, 762, 763) – matched filter of Applicant's specification) and the A/D converter (Okamoto - Fig. 105 (765, 766)) but does not explicitly disclose the low-pass filter coupled to matched filter to process filter signal to form processed signal.

Meanwhile Batra disclose the low pass filter (Fig. 40 (518, 520)) in UWB receiver to reject any images or adjacent channel interference (Fig. 40 (518, 520), paragraph [0374]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Okamoto, Knobel, and Batra as a whole to produce the invention as claimed with on expectation of further removing unwanted signals or interferences from adjacent channel (Batra – paragraph [0374]).

As to **Claim 24**, Knobel further disclose the known spread spectrum technique including CDMA, direct sequence spread spectrum, time hopping spread spectrum, etc. (paragraph [0008]). The suggestion/motivation is the same as that used in the rejection for claim 21.

32. Claims 25-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Pat. No. 5960028 to Okamoto et al. in further view of U.S. PGPub. No. 20040032354 to Knobel et al.

As to **Claim 25**, Okamoto disclose a method for transmitting data as a pulsed ultrawide band signal comprising (Fig. 1, Col. 1 lines 11-22, where wideband spread spectrum communication system is used for overcoming the multiple path fading and narrow band noise):

converting in a serial-to-parallel converter a signal to be transmitted from a serial sequence to a parallel sequence (Fig. 1 (5));

converting in a modulator said parallel sequence to a parallel stream of modulated signal, each modulated signal having a signal repetition period (Fig. 1 (19, 21, 23, 25), Fig. 29, Col. 39 lines 35-44, where the spreaded and modulated signals are multiplexed in one period (Fig. 29 (b)) to be transmitted in repeated fashion (repeated period));

delaying said parallel streams modulated signal by different time intervals within the same signal repetition period (Fig. 1 (27, 29, 31, 33), Col. 11 lines 53-63, where the delay time is inserted to reduce the interference between each parallel signal);

combining the delayed modulated signal streams to form a combined signal so that the modulated signal in the streams occur within the signal

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repetition period of a single signal (Fig. 1 (35), Col. 11 line 66-Col. 12 line 3, where the delayed modulated signal stream is multiplexed (combined) to be transmitted);

transmitting said combined signal (Fig. 1 (41), where the combined signal is transmitted through the frequency converting portion and antenna).

Okamoto disclose the transmitter for wideband spread spectrum communication system by S/P conversion, modulation, and delayed element (Fig. 1) but does not explicitly disclose the modulated signal being stream of impulse trains.

Meanwhile Knobel disclose the implementation of multi-band pulsed OFDM modulation (Fig. 14 (1404)) in transmitter to transmit train of pulses (Fig. 12) through the multiple bands (Fig. 14 and 12, paragraph [0135]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Okamoto and Knobel as a whole to produce the invention as claimed with on expectation of reducing the interferences, power consumptions, and increasing data rate by using multi-band pulse OFDM modulation over conventional narrow band communication system (Knobel – paragraph [0006-0008]).

As to **Claim 26**, Okamoto further disclose the method further comprising spreading in a spreader said parallel sequence after the step of converting said signal to be transmitted from a serial sequence to a parallel sequence (Fig. 1 (11,

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13, 15, 17), Col. 11 lines 47-52, where each parallel sequence is spread with PN sequences from PN generator).

As to **Claim 27**, Okamoto further disclose the method wherein the step of converting in a modulator said parallel sequence is after the steps of delaying said parallel streams and combining the delayed pulse streams (Fig. 4 (51), Col. 13 lines 50-59, where modulator is located after the delaying elements (27, 29, 31, 33) and combiner (35)).

As to **Claim 28**, Okamoto further disclose the method wherein the step of converting in a modulator said parallel sequence is before the steps of delaying said parallel streams and combining the delayed pulse streams (Fig. 1 (19, 21, 23, 25), Col. 11 lines 35-43, where modulator is located before the delaying elements (27, 29, 31, 33) and combiner (35)).

33. Claims 29-33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PGPub. No. 20040151109 to Batra et al. in further view of U.S. Pat. No. 5960028 to Okamoto et al. and U.S. PGPub. No. 20040032354 to Knobel et al.

As to **Claim 29**, Batra disclose a method for receiving data as a pulsed ultrawide band signal comprising (Fig. 40, paragraph [0364, 0365, 0372, 0373], where both the transmitter and receiver architectures is listed for UWB system):

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receiving said ultrawide signal (Fig. 40, where the signal is received through the antenna);

filtering in a matched filter said received signal to form a filtered signal, said filter being matched to the pulse shape of said received signal (Fig. 40 (506, 508), paragraph [0373, 0374], where the received signal is mixed down (filtered) to baseband signal using carrier frequency centered at 4096 MHz. Such configuration is equivalent to Applicant's described matched filter in Fig. 8 (72) and Page 12 5th paragraph where receiver matched filter is sinusoidal waveform (local oscillator having center frequency));

processing in a low-pass filter coupled to said matched filter said filtered signal to form a processed signal (Fig. 40 (518, 520));

converting said processed signal from an analogue signal to a digital signal (Fig. 40 (518, 520), paragraph [0375], where the ADC running at 512 MHz with 4-bit resolution (higher rate resolution));

serial-to-parallel converting said digital signal at a rate greater than the pulse repetition frequency of said received signal and to produce a sampled signal (Fig. 40 (534, 518, 520), paragraph [0375], where the S/P block (534) converts the serial digital signal generated by the ADC running at 512 MHz with 4-bit resolution (higher rate resolution) to parallel signal for further processing);

signal processing said sampled signal to produce an output signal representative of said received data (Fig. 40 (536, 538, 540, 542, 544), paragraph [0375, 0376], where the receiver include FFT, despreader, equalizer,

decoder, and descrambler to generate serial data stream from the digital data stream from the ADC).

Batra disclose the transmitter architecture for UWB system employing time-frequency interleaved OFDM (Fig. 40, paragraph [0022, 0023]) but does not explicitly disclose the pulsed ultrawide band signal, said pulsed signal having a pulse shape, a bandwidth, a pulse width, and a pulse repetition frequency, said pulsed signal comprising two or more interleaved pulse trains having equal pulse repetition periods, said interleaved pulse trains being spaced by a pulse spacing, said pulse repetition period being greater than said pulse spacing.

Meanwhile Okamoto disclose the modulator and corresponding demodulation in receiver to modulate and multiplex signals interleaved in one period (Fig. 29 (b)) to be transmitted in repeated fashion (repeated period) (Fig. 1 (19, 21, 23, 25), Fig. 29, Col. 39 lines 35-44). Also time difference between adjacent signals is kept at constant further limiting interference between signals (Col. 13 lines 15-21, where pulse spacing is shorter than repetition period of T shown in Fig. 29 (b)).

Also Knobel disclose the implementation of multi-band pulsed OFDM modulation (Fig. 14 (1404)) in transmitter to transmit train of pulses (Fig. 12, implicitly having pulse shape, pulse width, and pulse repetition frequency) through the multiple bands (Fig. 14 and 12, paragraph [0135]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Batra, Okamoto, and Knobel as a whole to

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produce the invention as claimed with on expectation of reducing the interferences, power consumptions, and increasing data rate by using multi-band pulse OFDM modulation over conventional narrow band communication system (Knobel – paragraph [0006-0008]).

As to **Claim 30**, Batra further disclose the method further comprising separating in-phase and quadrature pulse chains from said received signal (Fig. 40 (506, 508), paragraph [0373], where the received signal is mixed down (filtered) to baseband signal (I and Q) using carrier frequency centered at 4096 MHz ($\cos(2\pi f_c t)$ and $\sin(2\pi f_c t)$ sinusoidal wave)).

As to **Claim 31**, Okamoto further disclose the method wherein the step of processing the sampled signal comprises delaying said sampled signal by one or more pulse repetition periods (Fig. 12 (97, 99, 101, 103), Col. 13 lines 22-25, where the equivalent delay is performed in the receiver by delay element (Fig. 12 (97, 99, 101, 103)) as delay element added in the transmitter (Fig. 1 (27, 29, 31, 33)). The suggestion/motivation is the same as that used in the rejection for claim 29.

As to **Claim 32**, Okamoto further disclose the method wherein the step of processing the sampled signal further comprises selecting a predetermined pulse stream from said received pulsed signal (Fig. 12 (97, 99, 101, 103), Col. 14 lines

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51-54, Col. 48 lines 33-37, where the digital delay element is used for adjusting delay amount which varies with number of multiplexing signals. Also it is well known in art that multiple tap delay is used for adjusting delay in line as shown in Fig. 2 (Col. 2 lines 23-38) of U.S. Pat. No. 7088172 presented here as evidential reference). The suggestion/motivation is the same as that used in the rejection for claim 29.

As to **Claim 33**, Batra further disclose the method wherein the step of processing the sampled signal comprises equalizing one or more channels in said predetermined pulse stream to form an output signal representative of said received signal (Fig. 40 (540), paragraph [0376], where the equalizer compensate the effects of the channel).

As to **Claim 35**, Batra further disclose the method further comprising despread said delayed signal (Fig. 40 (538) - despread).

34. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. PGPub. No. 20040151109 to Batra et al., U.S. Pat. No. 5960028 to Okamoto et al., and U.S. PGPub. No. 20040032354 to Knobel et al. in further view of U.S. PGPub. No. 20030123525 to Smee et al.

As to **Claim 18**, Batra in view Okamoto and Knobel disclose the receiver and method comprising the equalizer for compensating effects of the channel (Batra - Fig. 40 (540)) but does not explicitly disclose the equalizing comprises applying a recursively square algorithm to said predetermined pulse stream.

Meanwhile Smee disclose the adaptive equalizer at the receiver using prescribed algorithm such as “least mean square” (LMS) or “recursive least squares” (RLS) to estimate the adaptive equalizer coefficients in order to compensate for the Inter Symbol Interference (ISI) caused by transmitter and receiver filter and the communication channel (paragraph [0011]).

Therefore, one of ordinarily skilled in the art would have found obvious from the combined teachings of Batra, Okamoto, Knobel, and Smee as a whole to produce the invention as claimed with on expectation of further reducing Inter Symbol Interference (ISI) caused by transmitter and receiver filter and the communication channel (Smee – paragraph [0011]).

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SUNG AHN whose telephone number is (571)270-3706. The examiner can normally be reached on Monday-Friday, 7:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571)272-3021. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

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